

SCIENCE

FRIDAY, JUNE 1, 1888.

LAST WEEK WE CALLED ATTENTION in a few words to the struggle which is going on in the New York City Board of Education over the election of a superintendent of schools. It is a cause of gratification to observe that the question has been lifted above and beyond mere petty detail, and made to rest on broad educational principles. Commissioner Sprague, who has conducted the inquiry into the fitness of the present incumbent for re-election, has shown great ability and a thorough grasp of the real issue. In his examination of Mr. Jasper he brought out the fact that the latter did not attend educational meetings, did not write or speak on education, and for four years had made no attempt to visit and inspect the schools systematically. On being pressed for an explanation, Mr. Jasper said that he had no time for any of these things! In other words, he is so busy marking examination-papers, computing percentages, and doing other trivial clerical work, that he could not be in any sense of the word a superintendent of schools. This admission should be a source of shame, both to the Board of Education that permitted such a state of affairs, and to the superintendent who did not protest against it. It proves exactly what has been charged; namely, that neither the majority of the Board of Education nor the city superintendent are fit for the positions they hold. In a series of interviews with four or five of the most prominent and respected educators in New York City, which a daily paper has published, substantially the same criticism that we made in these columns last week occurs. One said, "Our system does not properly educate, and is conducted too much on the principle that the teacher's work is to cram the pupil with hard facts." Another added, "The theories of the Board of Education are on trial. . . . The school system in this city is nothing more nor less than a magnificent piece of machinery, crushing out, whether designedly or not, all individuality, and tending to repress all the natural activities of the pupil. Uniformity is the thing aimed at, and the uniformity achieved is that of mediocrity." These expressions come from men who have made education a lifelong study, and who know what they are talking about. The force of such damaging testimony cannot be easily broken.

THE RESIGNATION OF PROFESSOR LOVERING of the chair at Harvard which he has held for fifty years calls for more than passing mention. Professor Lovering first entered the service of the college as a tutor in 1836, and in 1838 was elected Hollis professor of mathematics and natural philosophy. During this period much of the development of physical science has taken place, Professor Lovering's contributions winning for him first the presidency of the American Association, and later that of the American Academy, over which latter society he still presides, following in the line of the very distinguished men who have held the office. In accepting the resignation, which takes effect next fall, the president and fellows expressed their belief that "as a teacher, an administrative officer, and a member of the faculty, Professor Lovering has served Harvard College with perfect fidelity and loyalty, and with sound discretion. As a public lecturer and man of science, he has done honor to the university, and to the department of instruction which he represented." They also felicitate Professor Lovering and themselves upon the condition of assured prosperity in which he leaves the department of physics,—the department to which he

has devoted a long and well-filled life. The successor of Professor Lovering is Prof. B. O. Peirce, who has given much promise in mathematical physics.

THE YELLOWSTONE NATIONAL PARK.

THE present number of *Science* is accompanied by a map of the Yellowstone National Park, reduced from the surveys of the United States Geological Survey. The four-sheet map of the latter, which is based on explorations during the years 1884 and 1885, gives for the first time accurate information regarding the configuration of mountains and valleys. We do not deem it necessary to dwell upon the wonders of the park, which have for years and years proved so attractive to Americans as well as to foreigners, but it may be of interest to learn what measures have been taken of late to improve it and to preserve its natural beauties.

As in 1886 Congress failed to make any provision for the pay of the superintendent of the park, a detail of cavalry was sent to do duty in the park. One of the principal dangers the protectors of the park have to contend with are forest-fires, many of which originate through the carelessness of camping-parties. In August, 1886, many square miles of woods near Gardiner River were thus destroyed before it was possible to check the progress of the fire. Some of these forest-fires are attributed to unscrupulous hunters, who, being prevented from hunting in the park, resort to this method of driving the game beyond the park limits. It is stated that the park is surrounded by a class of old frontiersmen, hunters and trappers, who, as the game diminishes outside the park, increase their efforts, and resort to all sorts of expedients to get possession of that which receives the protection of law. Some fires seem also to have been started by Bannock Indians from the Lemhi Reservation.

Another source of danger to the beauties of the park lies in the vandalism of the visitors, which cannot be condemned too severely. The acting superintendent, Capt. Moses Harris, says in his report to the secretary of the interior, 1886, regarding this subject:—

"It is apparent from the most casual observation that the means heretofore employed for the preservation of the natural objects of wonder and beauty in the park have been entirely inadequate. It may be said without exaggeration that not one of the notable geyser formations in the park has escaped mutilation or defacement in some form. Those that have been most fortunate are covered with lead-pencil inscriptions recording the names of those shallow-minded visitors to whom such a distinction is a pleasure. A lead-pencil mark seems to be a very harmless defacement, but names bearing date of 1880 are still discoverable through the thin deposit of silica; and, if this marking should go on unchecked, in a very few years these once beautiful formations will have become unsightly and unattractive objects. At the Upper Geyser Basin names with date of June, 1886, have been chiselled into the solid geyserite so deep, that, in the slow process of nature, many years must elapse before this mutilation will be obliterated. Not content with the defacement of the formations, efforts are constantly being made to destroy the geysers themselves by throwing into them sticks, logs of wood, and all sorts of obstructions. The eruptive force of several of the geysers has been totally destroyed by vandalism of this character. The footsteps of the throngs of visitors are wearing away the delicate and lace-like tracery of the silicious deposits, and in a few years the formations surrounding the geysers will present the appearance of the worn pavements of a city street. The wilful defacement of these beautiful objects can only be prevented by watchful supervision, supported by the rigid enforcement of lawful penalties. A certain amount of wear and deterioration, incident to the multitude of visitors, is probably unavoidable."

In the annual report for 1887 the superintendent gives an interesting statement regarding the game living in the limits of the park:—

"Immense herds of elk have passed the winter along the travelled road from Gardiner to Cook City with the same safety which herds of domestic range cattle enjoy in other localities. Several stacks of hay, which had been placed along this road in anticipation of winter freighting, were appropriated and doubtless enjoyed by these animals. It is difficult to form any accurate estimate concerning the number of elk that passed the winter in the park: certain it is that the number that wintered in the valley of Lamar River and on its tributaries have been estimated by all who saw them at several thousands. The elk are accustomed, when driven out of the mountains by the snows of winter, to follow down the course of the mountain-streams into the lower valleys. For this reason but little efficient protection can be afforded to this species of large game in the park except upon the Yellowstone River and its tributaries.

"The elk which follow down the outward slopes of the mountains surrounding the park, along the tributaries of the Madison and the Gallatin on the west, or the Snake River on the south, pass beyond the park limits before the hunting-season permitted by the territorial laws has closed, and fall an easy prey to the hunters who are in wait for them.

"A small number of buffalo still remain in the park, but, after as careful and thorough an investigation as is practicable, I am unable to state their numbers with any approach to accuracy. My impression is, that they have been heretofore somewhat overestimated, and that at the present time they will not exceed one hundred in number. They are divided into three separate herds. One of these ranges between Hell-roaring and Slough Creeks in summer, well up on these streams in the mountains, outside the park limits; and in the winter lower down, on small tributaries of the Yellowstone, within the park. If the reports made several years ago can be relied on, this herd has rapidly diminished, and it is doubtful if it now exceeds some twenty or thirty in number. Whether or not this decrease has been due to illegal killing by hunters, or to other causes, I am unable to say, though I do not believe that many have been killed within the past two years. Another herd ranges on Specimen Mountain and the waters of Pelican Creek. The herd was seen by reliable parties several times last winter, and was variously estimated at from forty to eighty. A traveller on the Cook City road claimed to have counted fifty-four near the base of Specimen Ridge. A scouting-party which I sent out during the month of May found but twenty-seven head of this herd, with four young calves. It is possible that the herd at this time was broken up, and that but one portion of it was found. The third herd ranges along the continental divide, and is much scattered. A band of nine or ten from this herd was seen several times this spring in the vicinity of the Upper Geyser Basin. It will take close observation for several years to determine with any certainty the number of these animals, or whether or not they are diminishing in numbers. It is practically certain that none have been killed within the park limits during the past two years, and yet there is an equal certainty that the present numbers do not approach those of past estimates.

"Large numbers of antelope are found in the park. A herd of some two hundred passed the winter within a mile of the town of Gardiner, pasturing on the plain between the Yellowstone and Gardiner Rivers, south of the town. They were unmolested, though it was found necessary to occasionally drive them back towards the hills, that they might not get beyond the park limits.

"The mountain sheep are found in all of the mountain ranges within the park. A band of seven or eight spent a large portion of the winter in the cliffs along the travelled road between Mammoth Hot Springs and Gardiner, and they became so accustomed to the sight of travellers as to manifest but little more timidity or wildness than sheep of the domestic variety."

The progress of road-construction in the park has been greatly retarded by the lack of sufficient appropriations. It is greatly to be regretted that the beauties of the park, that, in the words of the statute, has been "set apart as a public park or pleasuring-ground for the benefit of the people," is not rendered accessible in all its

parts to the public by the construction of roads and bridges, the cost of which has been estimated at \$130,000.

It appears that the only method of enforcing the laws and regulations regarding the park is the expulsion of all offenders, there existing no court which has jurisdiction over such cases. The superintendents of the park have for a number of years asked that such a court be established, but so far Congress has not acted upon their suggestions.

It seems, however, on the whole, that the park is well protected from injury, and the steadily increasing number of visitors shows that it has not decreased in attractiveness either to Americans or to foreigners.

A NEW SCIENCE OF MIND.

THE authorities of the Collège de France, the representative institution of the higher education in France, have transformed, as already reported in *Science*, the chair of the 'law of nature and of nations' into a chair of 'experimental and comparative psychology.' The significance of this action lies in its calling the 'new psychology' to a co-ordinate rank with the more widely recognized and historically sanctioned sciences. This honor has naturally caused considerable inquiry as to the nature and the objects of the new science; and M. Paul Janet, the well-known writer on ethical topics, undertakes to enlighten his countrymen in this regard ('Une Chair de Psychologie Experimentale et Comparée au Collège de France,' *Revue de Deux Mondes*, April 1, 1888).

M. Janet, with perhaps pardonable patriotism, poses the new psychology as of French origin, but it is really connected with the past by many roots. It is related to the objective study of mind furthered by Hartley and Locke, by Descartes and Cabanis; its welfare has been more essentially secured by the general renaissance of physiological and neurological studies of which the name of Johannes Müller is representative; the modern alienists drew attention to the valuable mine of mental phenomena that disease laid bare; and, after it emerged as an independent study, it willingly acknowledged its indebtedness to physics and physiology, as well as to psychiatry and anthropology, without forgetting its parentage from the psychology of the past, itself the result of a progressive philosophic insight.

The term 'physiological psychology,' though quite generally in use to describe the new movement, really expresses but one, though perhaps the most important and advanced, division of a scientific, or, as M. Janet prefers, an objective psychology. The new psychology, however, is characterized as much by its method, its spirit, as by its contents; and it was for this reason that the chair was called one of 'comparative' and 'experimental' psychology.

Difficult though it is to summarize the various lines of interest that unite workers in the several specialties of the new psychology, the attempt may be useful. From the physiological side, psychology finds that the phenomena with which it is concerned occur in connection with a material organism of an intricate and mysterious construction. The analogues of the acts which we recognize in ourselves as the indices and concomitants of psychic states are unmistakably found in the lower animals. No matter how far down in the scale we descend, we nowhere lose the thread that makes the world akin. "The tendency of modern inquiry," says Mr. Tylor, "is more and more towards the conclusion, that, if there is law anywhere, it is everywhere;" and in the amoeba stretching out its extemporized arm in response to an irritation in its environment, psychology detects a real though remote analogy to that varied and far-sighted adaptation of means to ends that characterizes the life of a high civilization. The problem, then, is to trace the successive stages of this co-ordination of nervous structure with psycho-physiological function; to see reflex act emerging into instinct; to see instinct acquiring more and more adaptability, and sending the young into the world less freighted with the ready-made acquisitions of their ancestors, and freer to shape their lives according to outward conditions, until, in the human infant, nature presents at once the most helpless and the most educable of organisms. This general problem includes many special ones. In ascending the evolutionary scale, the nervous system increases in complexity; the parts become more specialized and more integrated; finer methods of

study are needed; and when we ascend to the highest product of evolution, the cortex of the human cerebrum, we are presented with the most interesting as well as with the most baffling aspect of the problem. A combination of methods, applied with patience and ingenuity, has divested the problem of some of its mystery. By co-ordinating the symptoms during life with the lesions revealed in the post-mortem examination; by exposing the brains of the lower animals to definite injuries, and carefully recording the results; by removing certain sense-organs or other parts in developing animals, and observing the defects of organization in the adult; by utilizing the exceptions that nature presents, — we have acquired a knowledge of the laws of the nervous system that would have seemed Utopian to our fathers, and that has already enabled the surgeon to predict the location of and remove a tumor in the brain.

The study of the senses has acquired a deeper and a richer meaning since the recognition of its place in a forming science has come about. The revolutionary discoveries of Helmholtz, whose success is so largely due to the union of two sciences, have induced others to continue the work in a hundred directions; and as indicative of the promise that these researches hold out, may be cited the conviction of an eminent physicist, Professor Mach, that the next great movement in the progress of science must come from the union of psychological points of view with physical methods and results. A mere mention of the many investigations that owe their origin to the work of Fechner and the formulation of his psycho-physic law must suffice to indicate the great activity in this field, and to justify the title of an experimental psychology. Moreover, the measurements of the time taken up by various psychic processes, the experimental study of memory, of attention, of the association of ideas, of the bilateral functions, of rhythm and the time-sense, of space and time perceptions, and so on, have led to the development of a mass of ingenious apparatus, and have made the psychological laboratory an indispensable requisite for its satisfactory instruction.

Morbid psychology is a rubric of paramount importance to the full and clear comprehension of the phenomena of mind. The genesis of illusions and hallucinations, the perversion of the natural channels of the emotions, the disintegration of the elements of personality, the dissolution of the logical powers, — all these problems transform the apparently wild and chaotic picture of the mad-house into a sad but interesting record of the process of character and of mind building. This interest is heightened by remembering that here lies the key to the understanding of the psychic epidemics that in the past have upset the rationality of mankind, and transformed the incoherent babbling of some demented soul into the mysterious utterances of a revealed spirit. It is furthermore heightened by the notice that the phenomena conveniently grouped as 'psychic research' are attracting, and always will attract. Hypnotism, after an adventurous and uncertain existence in the hands of charlatans, has been admitted into science; and although the literature of the topic, at least in France, is increasing out of all proportion to our insight into the nature of the phenomena, yet enough has been established to recognize in this semi-morbid condition the key to the solution of many otherwise barely accessible problems. With regard to those borderland phenomena, — 'telepathy,' 'clairvoyance,' and the like, — they illustrate the subtleness of the process by which false systems gain success, and demonstrate the advisability of having men who can speak on such topics with the authority of trained experts.

What its votaries have deservedly dignified into the science of 'anthropological psychology' offers a most attractive field for research. The customs and thought-habits of primitive peoples not only record the first stages in the progress that leads to culture, but prevent the formulation of notions that seem true enough when tested by our own civilization, but reveal the provinciality of their origin when applied to more rudimentary conditions of life. Instead of *résumé*-ing the many rubrics that here contribute to the completeness of a scientific psychology, one may refer to the works of Mr. E. B. Tylor as exemplifying at once the attractiveness of the subject, and the value of the results, under a learned and skillful treatment.

If we conclude this survey with the mention of the psychology of the developing child, glimpsing as it does, in the budding capabilities of the infant, the microcosm of the race and an epitome of the

struggle for civilization, it is not because the lines of research have been exhausted, but that, with the scope of the science thus outlined, what remains to be done will probably be suggested by what has been said. The psychology of the infant is not the only point at which psychology and education touch; but everywhere education must refer to psychology, of which, in the highest sense, it is only the practical application.

The movement has not been without its opponents. The cry has been raised that it is not a science, but a mere aggregation of disjointed facts: it shines by borrowed wealth. But the force of this objection is weakened, if we remember that a science maintains its individuality quite as much by the point of view from which it regards its subject-matter as from the nature of the subject-matter itself. It is not an evidence of weakness for one science to borrow from and build upon another; but it testifies to the unity of the phenomena of nature, and reduces the division of the sciences to what they at bottom represent, — the classification of the direction of men's interests. The chaotic condition of the facts with which psychology deals is rapidly disappearing, and it may yet hope to receive a unifying impulse such as Darwinism gave to zoology. It is, at all events, better to have a collection to arrange when the true method of arrangement shall be discovered, than not to collect because the ideal arrangement is not yet at our service.

Again: there are some, who, heedless of the caution of George Henry Lewes, — that the first question is not, "What does it lead to?" but, "Is it true?" — see in the objective study of mind the downfall of idealism, and of all the valuable beliefs that have clustered about it. They stigmatize it as materialistic. This is surely a misunderstanding. The history of the movement does not bear out such an accusation. The men the spirit of whose work is in line with a scientific psychology — Lotze, Helmholtz, Fechner, Wundt — are all of them the very opposite of materialists. The new movement does not attempt to usurp the place held by other studies, except as it is an advance upon them: it does not pose as the only department of philosophic learning. Its professors have fortunately been men of liberal sympathies, and deeply imbued with the historical sense. They do not claim to have created a science entirely new, unique, and undreamt of, but appreciate their development from the past. Their aim is to retain for the study of mental science that high place which has always been accorded it, by making it progressive and abreast of modern learning.

Professor Ribot, in the opening lecture of his course at the Collège de France (*Revue Scientifique*, April 14), taking a bird's-eye view of psychological activity in the various countries of civilization, saw everywhere signs of great promise. The literature is increasing both in value and in quantity. The science has reached the 'monograph' stage. Journals specially devoted to its interests, such as the *Philosophische Studien*, the *Revue Philosophique*, the *Rivista di Filosofia Scientifica*, and our own *American Journal of Psychology*, are flourishing; and laboratories and professorships for the dissemination of its teaching are being established at the leading universities. With the advantages that the youth and plasticity of our educational institutions give them, and the successful examples of the leading universities before them; with the practical ends that the new movement embraces; and with our pushing enthusiasm to have every thing that is new and good, — it seems justifiable to predict for scientific psychology a large and representative following in this country. JOSEPH JASTROW.

ABORIGINAL ARCHITECTURE IN THE SOUTH-WEST.

A FIELD-PARTY of the Bureau of Ethnology, in charge of Mr. Victor Mindeleff, has recently returned to Washington, bringing a large amount of new and valuable material. For a number of years past Mr. Mindeleff's investigations have been confined to the architecture of the South-west. One of the most interesting places visited by him during the past season was a group of cave-dwellings situated about eight miles north-east of Flagstaff, Arizona. These ruins had previously been visited by Major Powell and Mr. Stevenson.

The remains occupy the summit of a cinder cone, and extend some distance down the south side. The rooms are numerous,

and are excavated in the top and sides of the cone, forming rough, dome-shaped cavities, with an opening for ingress in the rounded or flat top of the dome. These cavities are densely grouped on the summit of the cone, and more scattered lower down. Halfway from the summit to the lowest level of occupation were found traces of a continuous rampart wall.

Large lumps of the porous substance composing the hill had been removed to form the chambers, and piled up outside, forming rude walls enclosing the openings. Some of the chambers are quite small, and were probably used for storage, as the only means of access to them is through the larger rooms. The floor-levels vary considerably: many of the storage-rooms are several feet higher or lower than the connecting large room. This difference in floor-level is in some cases the result of an effort to conform to the topography of the site.

The entrances are usually much broken away, but were probably rectangular. In several cases a rectangular niche or channel, forming part of the entrance-opening, was seen, occurring sometimes in the centre, sometimes at one end of the side of the same. These channels may have served as chimneys, as there is considerable evidence of smoke-blackening in the recesses, as well as on the roof of the cavities. An abundance of fragments of metates was found, of the massive type which occurs in the vicinity of Globe, and also some complete ones. Upon the upper part of the cone a considerable number of potsherds were seen, all the fragments quite small.

Some cliff-dwellings in Walnut Cañon, about twelve miles southeast of Flagstaff, Arizona, were examined. The ruins are quite small, rudely and carelessly built, and suggest occupation by a small community and for a short time. They are distributed over several ledges of the cañon at varying heights from the stream-bed below. At the time of the visit the bed of the stream was dry. Above, adjoining the cañon brink on the north, occur several clusters of rooms which probably had some connection with the cliff-dwellings. Two piles of stones — the remains of rude walls — were seen at a distance of three or four miles from the cliff-dwellings. They seem to be the remains of single rooms. Similar vestiges were found at points north of the vicinity of the cave-lodges above described.

In the vicinity of Keams Cañon, Arizona, an extensive group of ruins was examined, occurring along the north border of the Jeditoh valley, on an escarpment overlooking that valley. There are seven ruins in the group, so far as known, distributed over an extent of twelve miles. The westernmost and largest ruin is known as Awatobi, or under its Navajo name of 'Talla Hogan.' It has been often visited by parties of the Bureau of Ethnology and by others, and has been identified as the Aguatobi of Espejo's narrative (A.D. 1583). It was occupied only a short time after Espejo's visit. The whole group of ruins is directly connected by tradition with the present inhabited villages of Tusayan (Moki), having been built and occupied by gentes whose descendants constitute a portion of the present Shimimo Indians. Awatobi is an extensive ruin, and others of the group are but little inferior in size, though in the latter, as a rule, no standing wall remains. The direction and distribution of the walls can, however, be easily traced. All the ruins of this group occur on the immediate edge of the escarpment, and overlook wide areas of valley-bottom, including fine stretches of cultivable land.

The party afterwards camped for some time in the vicinity of Oraibi, the westernmost and largest of the present villages of Tusayan. The work here was a continuation of the work of a party which visited Oraibi in 1882, when the village was surveyed. A study was made of the constructional devices in use at Oraibi and some of the other villages, and many photographs of interesting features were made. The methods in use here are more primitive than in any other pueblo. They show also less white or Mexican influence, and consequently are valuable as throwing light on primitive architecture.

Two interesting ruins were discovered and surveyed. They were both found upon the west side of the 'Oraibi Wash,' a large valley running north and a little east from Oraibi, from which the ruins are distant seven and fourteen miles respectively. They both occur upon the summits of small buttes detached from, but close to, the

edge of the mesa forming the west side of the valley, and are so situated as to command an extensive view of the valley proper and of one or more of its smaller branches. The buttes are quite similar in character. The summit, in both cases, is of small area, formed of bare rock, almost flat, and breaking off almost continuously around its edge into a ledge eight or ten feet high. The ruins occupy the whole of the summit, and extend down over the slopes, which fall away from the base of the ledge. The ruins themselves are similar in character, and both are directly connected traditionally with Oraibi. The Navajos also have legends concerning them.

In the northern ruin was found an interesting cave, or underground apartment, occurring within the ruin. The entrance was very small, and had been, until recently, carefully concealed. It is said to have been broken open by Navajos in search of ancient pottery. Inside were found some well-built stone walls with supporting timbers, but the cave was too much filled up with dust and *débris* to permit much exploration without excavation, for which both time and means were lacking. A visit was paid to the small village of Moen-Kopi, which is inhabited during the farming season only, and occupies the same relation to Oraibi that Ojo Caliente, Nutria, and Pescado bear to Zuñi, — a sort of outlying settlement or farming pueblo. It is situated on the north side of the Moen-Kopi Wash, which for some distance above and below this point presents an almost vertical wall. Here, however, the cañon wall breaks down into a gentle slope, and a small valley puts out to the north. It is at the junction of this valley with the main cañon that the village is located, about halfway up the slope. In the smaller valley are a number of fine springs, situated some distance above the cañon bottom. These springs probably determined the location of the settlement. The whole of the valley was under cultivation, being irrigated from these springs, as was also a considerable portion of the bottom of the cañon proper, overlooked by the village. Farther down were large fields of corn and wheat. One of the most interesting things to be seen in this vicinity is the cotton-fields. Cotton was grown by these Indians prior to their discovery by the Spaniards, and occupies a very important place in their mythology. It is a sacred plant, and garments or articles of apparel made from it are used only in the sacred ceremonials. At the present time Moen-Kopi is the only place where cotton is grown, but tradition mentions several other localities. Seeds of North Carolina cotton and Maryland water-melons, sent out in 1885, were found to have deteriorated but slightly, though they had passed through two plantings. The cotton is not allowed to ripen on the stalk; but the pods are broken off while yet green, and laid in the sun, upon the roofs of the houses, until they burst open. This village is but fifteen or twenty years old, but has been built on the site of an older settlement.

Subsequently the party spent six weeks at the Chaco ruin. These ruins have been frequently described, and ground plans of some of the larger ones have been published. An accurate survey of the more important ruins was made, and the plans secured reveal many important points. The drawings and descriptions of Simpson and Jackson, made in 1849 and 1877, are of so general a nature as to be misleading. No such symmetry, for example, as that portrayed in their plans, is to be found: in this respect the Chaco ruins are not superior to hundreds of others. The quality of the masonry has also been much exaggerated, though doubtless unintentionally. A close examination revealed great ignorance, on the part of the builders, of some of the simplest principles of construction. Another feature of interest was the very plain evidence of successive or different occupation. In Pueblo Bonito, the largest ruin of the group, three distinct types of construction were found, lapping over and extending into each other. Several ruins not previously known were surveyed, and others were visited. Mr. Morgan attempted to identify the Chaco ruins with the celebrated 'Seven Cities of Cibola;' but the number is nearly seventy, instead of seven. Upon the exposed or south side of the cañon bottom are a great number of ruins which so far have been overlooked, though they are not inferior in extent to the well-preserved specimens under the north cliff; they are, however, almost completely obliterated through the action of the elements. There is no reason to suppose, however, that the ruins on the south side of the cañon bottom are more

ancient than those upon the northern side: their exposed position has simply hastened their destruction.

Late in the season some of the party visited and made a survey of the Pueblo of Jemez, situated upon a creek of the same name, a small tributary of the Rio Grande. An accurate ground plan was made, corresponding in every respect to the plans made in previous years of the pueblos of the Little Colorado.

At various times during the progress of the field-work, opportunities were afforded of making studies of Navajo architecture. These Indians build a house of a rudely conical form, composed of brush and earth upon a supporting framework of timber; and their 'hogans' are of considerable interest, and throw much light on primitive house-construction. While the party was at Keam's Cañon a large number of these houses were examined, under the guidance and with the help of some of the best men in the tribe. No less than five distinct types of structures were found, although the details of construction are minutely prescribed and rigidly adhered to. The 'hogans' always front the east; and the erection of one is an important and a sacred event to those interested, being accompanied by many ceremonial observances and an elaborate ritual.

The material collected during the field-season will be incorporated into reports now being prepared by the Bureau of Ethnology.

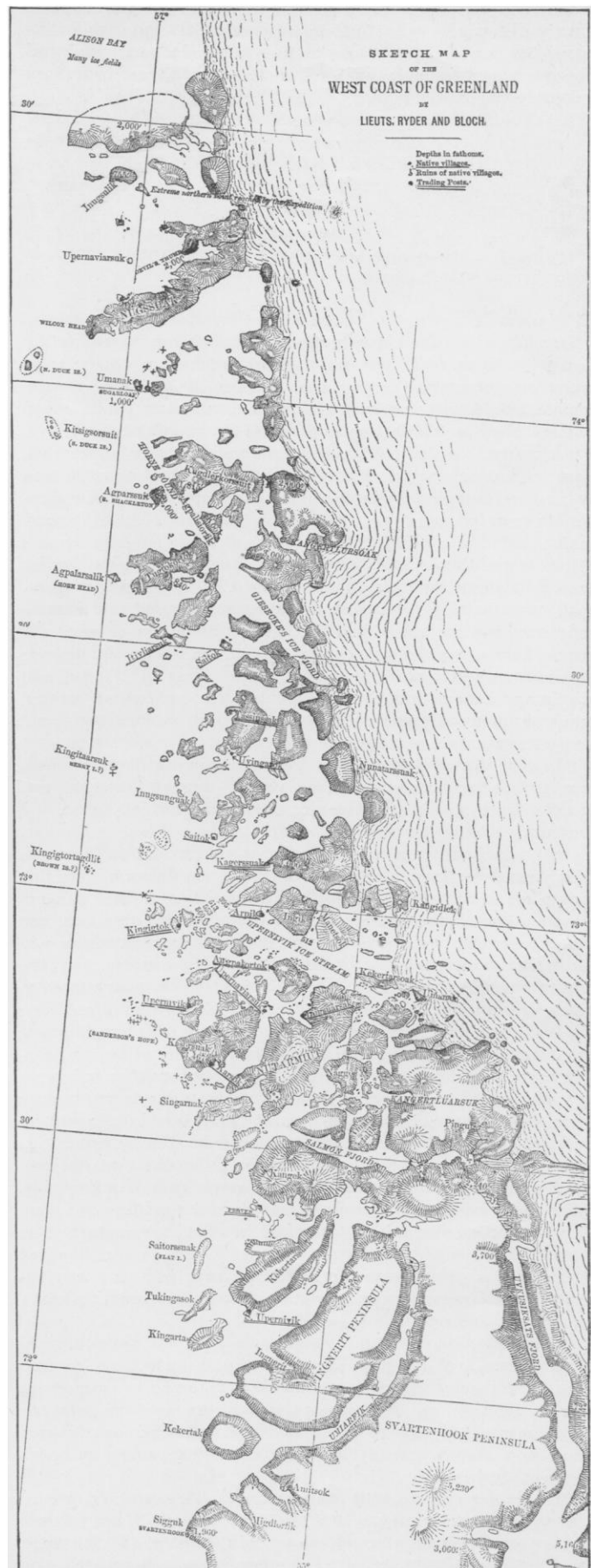
EXPLORATIONS IN GREENLAND.

In the year 1886 the Danish Government sent out an expedition for the exploration of the region of Upernivik and Tassiusak, which had hitherto been almost unknown. Lieutenants Ryder and Bloch wintered in Upernivik, and intended to set out early in spring on an expedition northward. Unfortunately the winter proved to be very severe, and the dreaded dog's disease swept away the dogs of the natives, compelling the explorers to start as soon as the increasing daylight permitted, as the dogs were wanted for sealing in April and May. On Feb. 21, 1887, they left Upernivik, and on the following day arrived at Tassiusak, the most northern trading-station. Here they procured a few dogs, and continued their northward journey, the thermometer ranging constantly under the freezing-point of mercury. As the Greenlanders did not build snow-houses, travelling was very difficult, and the explorers as well as their Eskimo companions suffered severely from frost-bites. The difficulties were increased by deep snow; and as no ice-bears were met with, on which the travellers had to rely for dog's food, they were compelled very soon to turn back. The failure of this expedition to reach the northern parts of Melville Bay is to be greatly regretted; but its results show that an exploration of the coast by means of dog-sledge, and early in spring, is not at all difficult.

The travellers reached Upernivik in March, and in April explored the large fiord east of the colony. Here the velocity of the glacier which empties itself into the sea was measured, and found to be thirty-three feet, while in August it amounted to ninety-nine feet in twenty-four hours. This result is very remarkable, as measurements of the southern glaciers show a comparatively uniform velocity throughout the year.

On May 7 the first sign of open water was seen on the western horizon; on May 23 the first whaler made his appearance on the outside islands; but the harbor of Upernivik was not open until June 11. This was considered a late date for the breaking-up of the land-ice on the Greenland coast; while in Melville Bay it lasted well into July or August, and on the west coast of Baffin Bay even until late in August. On June 26 Lieutenants Bloch and Ryder made another start northward with two boats. Their progress was greatly retarded by the prevailing fogs, while drifting icebergs made travelling dangerous. On Aug. 4 they reached their extreme northern point in $74^{\circ} 25'$ north latitude. The sea farther to the northward was covered with ice; and as the homebound vessel, which the travellers were instructed to take at Upernivik, left on Aug. 15, they were obliged to return.

Among the results of this journey one is of great interest, — the fact that even the extreme northern point reached by the expedition is inhabited by Eskimo, who visit it every spring. The most northern native village is Itivliarsuk in $73^{\circ} 30'$ north latitude; but



farther north numerous ruins of villages were found, and the Eskimo had names for every point and island. Thus it appears that the distance between the North Greenlanders and the inhabitants of Smith Sound is not so great as was generally assumed, and it becomes very probable that intercourse between these tribes in a limited degree existed not very long ago, or maybe still exists.

SCIENTIFIC NEWS IN WASHINGTON.

Collectors and Collections of Jewels and Precious Stones : an Interesting Chapter by George F. Kunz. — A Steel 'Vacuum' Balloon : the Absurd Proposition of a Scientific Crank indorsed by a Committee of Congress. — Death of Prof. E. B. Elliott : a Great Loss to Science. The Tape-Worm in Sheep.

Collections of Jewels and Precious Stones.

THE following is an extract from a paper lately prepared by Mr. George F. Kunz of Tiffany & Co., New York, which will be used as the basis of a report on precious stones, which will appear in the volume on 'Mineral Resources of the United States,' to be issued by the United States Geological Survey a few months hence : —

"A regrettable dispersion of jewels and precious stones took place on May 12 and 14, 1886, when the famous collection formed by the late Henry Philip Hope, and exhibited at the South Kensington Museum for many years, was sold at auction. The Hope collection included the *saphire merveilleux* of Madame de Genlis's 'Tales of the Castle ;' the King of Candy's cat's-eye, the largest known, having a diameter of an inch and a half ; the Mexican sunopal, carved with the head of the Mexican sun-god, and historically known since the sixteenth century ; an enormous pearl, the largest known, weighing three ounces, and two inches in length ; the aquamarine sword-hilt made for Murat, King of Naples ; and also many curious diamonds, sapphires, emeralds, and several hundred unique and magnificent gems. Such a collection should be preserved intact as a national possession.

"In 1886 it was decided by the French Assembly that the crown jewels, with the exception of the famous 'Regent' diamond, two of the mazarines, and a few historic pieces reserved for the national museums, should be sold at public auction. These exceptions were made because it was feared that they would fall into the hands of Americans. The sale of this great historic collection took place in May, 1887. The 48 parcels were subdivided into 146 lots ; and there were 68 buyers, 12 of whom bought over 1,000,000 francs' worth each. The largest lot, the great corsage, which sold for 811,000 francs, was purchased by a single American firm, the largest buyer at the sale. The purchases of the firm amounted to 2,249,600 francs, or about 34 per cent of the entire sum realized ; while as to quality, the same firm obtained more than two-thirds of the finest gems. Among them were the three mazarines ; a pear-shaped rose brilliant, weighing $24\frac{3}{4}$ carats, for 128,000 francs ; a pear-shaped white brilliant, weighing $22\frac{1}{2}$ carats, for 81,000 francs ; a white brilliant, weighing $28\frac{1}{4}$ carats, for 155,000 francs ; and an oval brilliant, weighing $18\frac{3}{4}$ carats, for 71,000 francs ; or 435,000 francs for the four. All but one of their purchases were secured by private American customers. The great interest attached to this sale was due not only to the fact that many of the gems were of very fine quality, but also to their historic associations. The history of many of them could be traced back several hundred years. In its way this sale did more than any thing that had before occurred to establish a reputation abroad for American taste, wealth, and enterprise.

"The collection of antique gems, numbering 331 pieces, formed by the Rev. C. W. King of Trinity College, England, the greatest of all writers on engraved gems, was sent to the United States for sale in 1881. This collection represents the keystone and the summing-up of Mr. King's vast knowledge, and none has ever been more thoroughly studied. His numerous writings mark an epoch in the study of this branch of archæology ; and only the loss of his sight led him to part with his treasures. The growing interest and taste in archæological matters in the United States induced him to send it here to be sold intact. In October, 1881, through the friendly mediation of Mr. Feuardent, it was purchased, and presented to the Metropolitan Museum of Art, by Mr. John Tay-

lor Johnson, then president of the museum, where it has since reposed.

"Near it will be placed the Somerville collection. Mr. Somerville, a Virginian by birth, and a gentleman of fortune and artistic tastes, while spending the past thirty-two years of his life in Europe, Asia, and Africa, has collected cameos, intaglios, seals, and other historical gems ; and, as a result of his liberal expenditure of time and money, he is to-day the owner of one of the most unique and valuable collections of engraved gems in the world, numbering over 1,500 specimens, including Egyptian, Persian, Babylonian, Etruscan, Greek, Roman, Aztec, and Mexican glyptic or jewel-carving art. All of these are represented by specimens of singular excellence, affording us a panoramic view of the achievements of civilized man in this direction. This remarkable collection, now at his home in Philadelphia, has been loaned to the Metropolitan Museum of Art, New York, where it will soon be placed on exhibition, and the public will be afforded every facility to study the beautiful achievements of the glyptic art.

"Of greater antiquity and archæologic value, because representing a period before gems were cut in the form of intaglios, is the collection of the Rev. W. Hayes Ward, consisting of 300 Babylonian, Persian, and other cylinders. Two hundred of these he himself collected in Babylon and its vicinity, and sold to the museum at a nominal figure. Since that time he has collected 100 more cylinders. Many of them date from 2500 B.C. to 300 B.C., and are cut in lapis lazuli, agate, carnelian, hematite, chalcedony, jasper, sard, etc.

"The death of Dr. Isaac Lea of Philadelphia, which occurred Dec. 19, 1886, in his ninety-fifth year, robbed the world of a great investigator in the field of precious stones. During the last twenty years of his exceptionally long and useful life, he devoted almost his entire time to studying the microscopic inclusions in gems and minerals ; and the cabinet he left contains thousands of specimens of rubies, sapphires, chrysoberyls, tourmalines, garnets, quartz, etc., all of which he had subjected to the most rigid microscopic scrutiny, noting every interesting fact on the accompanying label. Only a small part of his work on this highly interesting subject has been published by the Philadelphia Academy of Sciences, in two papers (in 1869 and 1876), but Dr. Lea made ample provision in his will for the publication of the remainder. His extensive collections of minerals and shells were bequeathed to the National Museum ; and the gem-collection, to his daughter, Miss Lea. Two months before his death, I spent two hours with him, examining a series of quartz inclusions, over which he worked with all the enthusiasm and brightness of youth.

"One of the many benefits traceable to the New Orleans Exhibition was the appropriation given to the National Museum for their exhibit. This was wisely expended by Prof. F. W. Clarke in the purchase of a complete series of precious stones, many of which, although not expensive, are still the finest in the United States, from an educational standpoint. Since the exposition many fine specimens have been added by purchase and donation, especially the diamonds and pearls presented by the Iman of Muscat to President Buchanan, consisting of 138 diamonds and 150 pearls, all of good quality. The collection numbers about 1,000 specimens, and embraces almost every known variety of precious stone, many of them in very fine examples."

A Proposed Steel 'Vacuum' Balloon.

The committee of the House of Representatives on acoustics and ventilation has actually reported favorably a bill appropriating seventy-five thousand dollars to subsidize a man who thinks he can construct a steel 'vacuum' balloon of great power. He is to be allowed to use the facilities of one of the navy-yards for the building of his machine, and is to have the money as soon as he has expended seventy-five thousand dollars of private capital upon his air-ship.

One of the mathematical physicists of Washington was asked by a member of Congress whether such a balloon could be successfully floated. He set to work upon the problem, and here are some of his results, which are rather curious : —

A common balloon is filled with hydrogen-gas, which, being lighter than air, causes the balloon to rise and take up a load with it. But, as the pressure of the gas within is equal to the pressure

of the atmosphere without, no provision other than a moderately strong silk bag is required to prevent collapse. The inventor of the proposed steel balloon hopes to gain greater lifting-power by using a vacuum instead of gas, the absence of substance of any kind being lighter than even hydrogen-gas. But he has to contend with the tendency of the shell to collapse from the enormous pressure of the atmosphere on the outside, which would not be counterbalanced by any thing inside of it.

The first question which presented itself was, how thick could the metal of the shell be made, so that the buoyancy of the sphere, which would be the most economical and the strongest form in which it could be constructed, would just float it without lifting any load? The computations showed that the thickness of the metal might be .000055 of the radius of the shell. For example: if the spherical shell was one hundred feet in diameter, the thickness of the metal composing it could not be more than one-thirtieth of an inch, provided it had no braces. If it was thicker, it would be too heavy to float. Now, if it had no tendency to buckle, which of course it would, the strength of the steel would have to be equivalent to a resistance of more than 130,000 pounds to a square inch to resist absolute crushing from the pressure of the air on a cross-section of the metal. Steel of such high crushing-strength is not ductile, and cannot be made into such a shell. If the balloon is to be braced inside, as the inventor suggests, just as much metal as would be used in constructing the braces would have to be subtracted from the thickness of that composing the shell. Of course, such a shell would buckle long before the thickness of the metal of which it was composed was reduced to .000055 of its radius. In other words, it is mathematically demonstrated that no steel vacuum balloon could be constructed which could raise even its own weight.

This is an illustration of how intelligently Congress would be likely to legislate on scientific matters unguided by intelligent scientific advice.

Death of Prof. E. B. Elliott.

Prof. E. B. Elliott, actuary of the Treasury Department, died suddenly of heart-disease on Thursday, May 24. He was nearly sixty-five years of age, and had been in the employ of the government since 1861. Professor Elliott was born in Sweden, Monroe County, N.Y., was graduated from Hamilton College, and, after teaching, became interested in the early development of telegraphy, — an interest which he retained as long as he lived. His great skill in making computations led him later to become the actuary of a life-insurance company in Boston, which position he filled until called to a similar office in the United States Sanitary Commission, in 1861.

In 1865 he was secretary of the commission for revising the United States revenue laws, and in 1871 entered the Civil-Service Reform Commission. His service as actuary of the Treasury Department has covered a great amount of statistical and computation work, which has been of the greatest value both to the government and to Congress. Professor Elliott was a member of the American Association for the Advancement of Science, of which he was chosen one of the vice-presidents in 1882. He was always very active, and presided over the section of economic science and statistics. He was also a member of the Washington Philosophical Society, and, at a meeting reviewing the work of the last ten years, it was reported that he had presented more papers to that society in that period than any other member. He was a member of the Cosmos Club and of many foreign learned societies.

He has published a great number of papers on mathematical physics and statistics, and in 1863 was a member of the International Statistical Congress in Berlin. He was greatly interested in horology, and an active member of the American Horological Society. At the time of his death he was engaged upon some important original investigations in that line. He was the first to have a clock constructed with hands to indicate standard time in the different divisions of this continent, long before any one hoped that it would be so generally adopted in the United States.

Professor Elliott prepared the tables of weights and measures in the appendix of Webster's 'Counting-House Dictionary,' and also those constructed on the metric system. He made his greatest reputation by his many valuable statistical reports on coinage, weights and measures, and on bonds. Some of these were pub-

lished in the last 'United States Census Report,' especially in the volume on vital statistics. He was a very genial and companionable man, rather contemplative, weighing carefully every new fact brought to his attention, and striving to foresee its effects. He will be greatly missed in Washington, and it will be very difficult to fill his place.

The Tape-Worm in Sheep.

Over eighty-five per cent of the sheep examined in Colorado last summer, according to a report made by Dr. Cooper Curtice to the Biological Society at a recent meeting, were infected by a tape-worm which is apparently indigenous to the Western country. Similar parasites had been described in 1856 by Dr. K. M. Diesing from specimens obtained by Natesen from Brazilian deer; but since that time the species was apparently unnoticed. This species is interesting, first, on account of its peculiar anatomy and the life-history of the individual parasite; second, because of the history of this species, which indicates it to be the first acquisition of a native parasite by the sheep on this continent, and its subsequent distribution in the United States; and, third, from an economic standpoint, the discussion of it including a consideration of the disease produced in sheep — the actual loss in death-rate, in wool and mutton, due to the parasite — and of the problem of cure and prevention of the disease.

After describing the parasite, Dr. Curtice said that these *tænia* occur in the duodenum and gall-ducts of Western lambs and sheep. They sometimes fill each. So tightly do they pack the gall-duct at times, that they cannot be withdrawn without breaking them, and the duct itself is distended by them. The smallest *tænia*, about half a centimetre long, are always found in the duodenum. They may be found from May to January: no observations were made in the winter months. From the duodenum they pass into the gall-duct, and occasionally into the pancreatic duct. The *tænia* are usually found in assorted sizes, from the young to the adult, but all may be nearly equal in size. From observations made upon a great number of lambs, it seems that these parasites cannot mature in less than six, or possibly ten months; so that the *tænia* in lambs would not be capable of infecting other lambs until the former became yearlings. No stages intermediate between the embryo escaping from the parent segment and the *tænia* five millimetres long were found.

As this species has not been described in Europe, and has not been noticed in eastern United States, it seems to have been acquired by the sheep since their importation into this country. Spanish sheep were first imported about 1820. From the early importation of sheep into Mexico and lower California arose those immense herds of mission sheep, and eventually the millions of sheep now found in the West. These sheep are rapidly being interbred with better grades of Eastern sheep; but the Mexican sheep furnished the material with which the sheep-men of the Plains began. The history of the acquisition and distribution of this parasite is believed, then, to be coincident with the history of these sheep since their arrival in this country. This parasite, originally affecting deer on this continent, is believed by Dr. Curtice to have become ingrafted into sheep, animals with similar life-habits, and, through the favorable conditions of ranching, to have spread rapidly with the increase of the flocks. Its distribution is now from Oregon and Wyoming southward, and Nebraska and Kansas westward.

The disease they cause in sheep makes its appearance gradually, and increases as the parasites grow. It is characterized by a hide-bound, tucked-up condition of the lambs, which is indicative of lean, ill-conditioned animals. Sheep may be apparently strong and healthy, and still harbor a number of these parasites. The poorer lambs generally die from exposure to inclement weather, or from smothering by piling on top of each other in storms in their endeavors to keep warm. The actual loss by death among the lambs is probably the least portion of it; that occasioned by the diminished amount of fat, muscle, and wool, which, though small for each animal, is constantly present from year to year, forms the larger, and aggregates a total loss to the sheep-husbandry of the Plains which is probably greater than that due to the scab-insect.

As yet no effective medicinal remedy for the destruction of these parasites has been discovered. Something may be done in the way of prevention; but, until the complete life-history of the *tænia* is

known, an entirely satisfactory plan of prevention cannot be proposed. At present, watering from troughs instead of from prairie pools, pasturing the lambs on prairie not recently pastured on by older sheep, and, after weaning, removing them to fresh pastures, are recommended. The practice of winter feeding on grain and hay undertaken by ranchmen is especially advisable in keeping up the health of infected animals.

ELECTRICAL SCIENCE.

Long-Distance Telephone-Lines.

It is known that there is considerable difficulty in transmitting speech by telephones over long distances, unless special precautions are taken in the construction of the lines. Dr. Wietlisbach has investigated the best conditions for telephone-lines, and has arrived at the following laws for the effect of the disturbing causes:—

1. The greater the resistance and leakage, the smaller is the strength of the received current.

2. Self-induction favors high notes.

3. Capacity favors low notes.

4. The resistance diminishes the effect of self-induction, and increases the effect of capacity.

5. Leakage diminishes the effect of capacity, and increases that of self-induction.

6. In a conductor having both self-induction and capacity, the relative intensity of the undulations increases and decreases periodically with the rise in the height of the note.

7. The magnetic permeability and the polarization of the conductor destroy the clearness of the transmission.

If all of the factors remained constant, it would be possible to design a line in which the relations between capacity, self-induction, resistance, etc., were such that all notes would be transmitted with equal clearness. For example: in a submarine cable where the capacity is great, a man's voice is heard farther and more distinctly than a woman's, since capacity favors low notes as compared with high notes; but it would be possible to so increase the self-induction of the line that both would be heard with equal distinctness, and at the same time both would be more perfectly reproduced, since all of the tones would be given their proper relative values.

Unfortunately this cannot be readily done in practice, since the leakage, which diminishes the effect of capacity and increases that of self-induction, is in most lines a quantity which varies with the state of the weather. Dr. Wietlisbach thinks, therefore, that the best way to build a line is to make all of the effects as small as possible, using a looped circuit of copper wire of low resistance and capacity. The empirical rule used in practice is to make the product of the resistance and capacity of any line less than a certain constant which has been determined by experiment. One would suppose, however, that, by roughly adjusting the capacity and self-induction of the line, much clearer speech would result.

POSSIBILITIES AND LIMITATIONS OF CHEMICAL GENERATORS OF ELECTRICITY. — Mr. Francis B. Crocker read a paper before the American Institute of Electrical Engineers with the above title, which cannot fail to be of interest at the present time; more especially as primary-battery schemes seem about to invade this country from what has been until now their home, England. Mr. Crocker first gives the ordinary formula for calculating the electro-motive force from the energy of chemical combinations that go on, — $E = 4.16 aH$, "where E is the electro-motive force, a the electro-chemical equivalent (grams per coulomb), and H is the number of heat-units (gram-degrees) produced per gram of material by the given combination." It should be pointed out here that this formula is slightly inaccurate, as has been shown by Willard Gibbs and Helmholtz. Gibbs gives it as (putting in the above form) $E = 4.16 aH \frac{T_0 - T}{T_0}$, where T is the temperature of dissociation, and T the temperature of the cell. We would expect, then, that the electro-motive forces obtained from experiment, and those calculated from the uncorrected formula, would be slightly

different, the latter being slightly higher. The following table is interesting:—

Metal.	Combining with Chlorine.		Bromine.		Iodine.	
	Calculated.	Determined.	Calculated.	Determined.	Calculated.	Determined.
Magnesium.....	3.24	3.10	—	—	—	—
Zinc.....	2.09	2.11	1.63	1.79(?)	1.05	1.25
Cadmium.....	2.00	1.90	1.58	1.58	.97	1.12
Aluminium.....	2.30	2.00	1.70	1.53	1.00	.88
Iron.....	1.75	1.60	1.50	1.30	.85	.68
Cobalt.....	1.64	1.43	—	—	—	—
Nickel.....	1.57	1.33	—	—	—	—
Tin.....	1.71	1.61	1.50	1.30	—	—
Lead.....	1.76	1.63	1.38	1.33	.85	.83
Copper.....	1.40	1.32	1.07	1.02	.60	.64
Silver.....	1.25	1.11	.97	.95	.50	.65
Antimony.....	1.30	1.22	—	—	—	—
Bismuth.....	1.30	1.21	—	—	—	—

The table of costs is, however, really important, especially to investors. In the table there is given opposite each substance the amount consumed and the cost for a horse-power hour. To find the total cost of a cell, the sum of the costs of its constituents should be taken. These cells all employ zinc as the positive element.

Material: Zinc used with following Electro- Negative or Depolarizing Ele- ments.	Electro-motive Force produced.	Weight of Zinc con- sumed per Horse-Power Hour.	Weight of Depolarizer consumed.	Total Cost of both Positive and Negative Material per Horse-Power Hour (Zinc costs 7 cents per Pound).
	Volts.	Pounds.	Pounds.	
Free iodine.....	1.200	1.67	6.53	\$22.97
Free bromine.....	1.790	1.12	2.76	1.12
Free chlorine.....	2.110	.95	1.04	—
Free oxygen.....	1.900	1.05	.26	—
Free sulphur.....	.950	2.10	1.03	.17
<i>Chemical Compounds.</i>				
Water.....	.500	4.00	1.10	—
Nitric acid.....	1.900	1.05	2.04	.20
Chromic acid.....	2.000	1.00	1.03	.28
Copper sulphate (anhyd.).....	1.079	1.86	4.55	—
“ “ crystals.....	1.079	1.86	7.13	.56
Iron perchloride.....	1.550	1.30	6.50	.74
Silver chloride.....	1.060	1.89	8.32	133.25
Mercury sulphate.....	1.420	1.41	10.70	5.45
<i>Mixtures.</i>				
Potassium bichromate (3 parts) } Sulphuric acid (7 parts) }	2.000	1.00	5.08	.27
Potassium bichromate (3 parts) } Sulphuric acid (4 parts) }	2.000	1.00	7.04	.42

In this table the products of the action are not taken into account. In some cases these products would be of considerable value, as

Mr. Crocker points out. There seems in the list no practical battery that will give a horse-power hour for less than twenty cents, — an enormous price compared with the cost of electric energy from a dynamo. One thing must be borne in mind: the cost of materials is obtained from price-lists of chemical companies, and would be materially decreased if the substances were made in large quantities. It will be seen that it will be impossible, however, to reduce the prices, just at present, to compete with a dynamo supplying energy at less than one cent per horse-power hour: so, while primary batteries have an important and extended field for telephonic purposes, telegraph-lines, bells, etc., they can hardly succeed in the more serious work of supplying power and light.

THE SEEL INCANDESCENT-LAMP FILAMENT. — A patent has just been issued in this country for an incandescent-lamp filament which is both novel and successful. The following is the method of preparation: threads of cotton, silk, or other vegetable fibre are steeped in a solution consisting of a silicate or salt, gum-senegal, and caustic soda, and then rolled between warm grooved rollers. The thread is then carbonized in the usual manner. To regulate the resistance of the resulting filament, it is placed in a vessel into which melted paraffine is run, and when the latter hardens an electric current is sent through the filament. As the thread heats, part of the paraffine nearest to it is liquefied, and, as the heat becomes more intense, carbon is deposited on the filament, the solid outer shell of the paraffine preventing any air from getting to it. The resistance gradually decreases as more carbon is deposited. When it reaches its proper value, the current is cut off, the whole of the paraffine melted, and the thread removed. The gum-senegal completely fills the pores of the filament, making it very strong, while the silicate and caustic soda surround the inner core. We have, then, three layers, — the central carbonized thread, the silicate, and the outer layer of deposited carbon.

THE CARRIÈRE ACCUMULATOR. — Several attempts have been made to produce a secondary battery in which the supports are of carbon instead of lead. A great difficulty in the present types of secondary battery lies in their excessive weight, caused to a great extent by the plates used as a support for the 'active' material, the inactive support-plates sometimes making up half the weight of the complete cell. Carbon would, for some reasons, make an excellent support for the active material: it is light, a good conductor, and it is not attacked by the acid in the cell. It has been found, however, that carbon plates will quickly disintegrate when used for battery purposes. If the active material is in cavities in the carbon plate, the expansion on discharge will gradually disintegrate the plate; while, if it is applied on the surface, it will soon drop off. M. Carrière makes his plates especially dense and hard, and, after applying the active material, he puts them horizontally in a cell with cocoanut-fibre between the plates. Whether this peculiar disposition of the plates and their special construction will be effective, can only be determined by experiment.

HEALTH MATTERS.

Wear and Tear of the Medical Profession.

THE State Board of Health of Illinois has recently published a tabulation and analysis of a mass of material which has been accumulating during the past ten years, bearing on the wear and tear of the medical profession of that State. This report, which is written by Dr. John H. Rauch, the able secretary of the board, is a most valuable contribution to the subject, and brings prominently to view the dangers incident to a medical life. Dr. Rauch says that for more than ten years he has been impressed in a general way with a conviction that this wear and tear was underestimated; that the active practice of medicine was not so conducive to longevity as is popularly supposed, nor as writers on such subjects, basing their conclusions on the data obtained from medical biographies, cyclopædias, etc., had been led to believe.

The source of error in this latter instance is obvious. The subjects of biographies, cyclopædia articles, memoirs, etc., are necessarily the men who have attained eminence, or at least prominence; and, in the nature of the case, prominence in the medical profession

is largely the fruit of long service and length of days. In other words, the exceptional class which, partly by very reason of long life, has attracted most attention, has been hitherto taken as an indication of the longevity of the profession as a whole. Thus we find one writer (Dr. George M. Beard) citing the deaths of 490 Massachusetts physicians whose average age at death was 57 years, and 35 out of every 100 of whom attained to 70 years. The average age of the subjects of Gross's 'Medical Biography' was 59 years, although it is ingenuously added that these "included several who died before their prime." Similarly Thacher's 'Medical Biography' makes mention of 145 physicians, and the fact that their average age at death was 62.8 years is quoted — as are the other instances — as proof of the longevity of medical men. Still another fact should be taken into consideration in the case of the class who figure in biographies. It is composed very largely of city physicians, and of the men who, in the smaller towns, are in a position to select their practice and adjust their labors with some regard to regular hours of sleep, meals, and relaxation. Comfortably housed at home, properly protected from the weather when making visits, free from the harassing cares of the *res angustæ domi*, and beyond the torturing anxiety which too often besets the struggle for practice, — the conditions of life in these cases are undoubtedly favorable to longevity. But these are the fortunate few, who bear no more numerical relation to the rank and file of the profession than the general officers do to the rank and file of an army.

Compared with these biographical subjects, upon whose length of honorable and successful years is predicated the assertion that the wear and tear of the profession does not prevent its members from attaining a high average longevity — compared with these, Dr. Rauch has, as the result of an extensive correspondence and systematic record, obtained data which show that the average age at death (in Illinois, at least) is not much over 52 years; and that only about 11, instead of 35, in every 100 attain the scriptural limit of threescore years and ten.

In older communities it is entirely probable that this rate may be exceeded. In Massachusetts, for example, the average age at death of 1,166 physicians, occurring during a period of nearly thirty-two years, is given as about 55 years; but the Illinois statistics — collected with painstaking care, and dealing with more than double the number living annually — do not furnish any such favorable result. To a very great extent the discrepancy between Illinois and Massachusetts is due, no doubt, to the different conditions which obtain in the two communities, — the one a comparatively newly settled State, with a population containing less than the normal proportion of the middle-aged and beyond; the other, one of the oldest settled commonwealths, with an excess of ages beyond the middle life, and with what Dr. Holmes calls the "adjustable conditions of living" so perfected as to materially conduce to the prolongation of life. But in addition to this difference there must also be taken into consideration the radical difference in the modes of collecting the data upon which the average age at death has been computed.

For Illinois these data have been obtained through official relations with an aggregate of some 14,000 physicians during a period of over ten years. The *personnel* may be taken as fairly representative of the profession generally, since it is composed of about one-sixth of physicians of a large city, Chicago, and the remainder of physicians of smaller cities and towns. During these ten years there has been an average of 6,000 living per annum, and the aggregate deaths have been about 800, or an annual death-rate of 13.3 per thousand. These round numbers and the period covered are cited to show that the data are extensive enough to insure substantially trustworthy results in the tabulations and deductions.

An examination of the tables shows, that while the death-rate of physicians in Illinois for the first few years after entering upon the practice of medicine is lower than that of all males in Illinois, and greatly less than that of the whole population of the country at large, it increases beyond that of the former class during the decade from 40 to 50, and is greater than that of the latter class in the next decade.

The obvious inference is, that physicians, on entering practice, form a class of selected lives, since they have an advantage of nearly 3 per cent as compared with all males at the same ages, —

that is, from 24 to 40, — and of over 50 per cent as compared] with the total population, both sexes, at the same ages ; this latter great disparity being no doubt largely due to the casualties among women during the child-bearing period. As the wear and tear of practice begins to tell, this advantage is soon lost ; so that during the period from 30 to 70 the death-rate of physicians is 8 per cent greater than that of all males, and during the period from 40 to 70 it is more than 11 per cent greater than that of both sexes.

An examination of the causes of death reveals the result of the exposure, irregular hours, broken rest, and mental anxiety which are the lot of the average practitioner.

In the grouped causes of death it is seen that consumption, diseases of the respiratory organs (including 91 from pneumonia), and Bright's disease caused 268 deaths, or more than one-fourth of the total. If to these be added a share of the deaths from diseases of the heart, — the *sequelæ* of rheumatism, — a fair estimate may be made of the effect of exposure to the vicissitudes of weather upon the wear and tear of medical life. As a result of mental strain and anxiety, of insufficient, irregular, and interrupted sleep, and similar causes, is the total of deaths from diseases of the brain and nervous system, embracing 43 from various forms of paralysis. In the group of zymotic diseases (enteric fever given separately) there were 5 deaths from diphtheria, 1 each from small-pox and yellow-fever, and 8 from traumatic infection (septicæmia, etc.), all contracted from attendance upon patients.

Less creditable to the *morale* of the profession are the 18 deaths from over-doses of opiates and narcotics, the 7 admitted suicides, and the deaths from alcoholism, direct and indirect, — 12 of the former, and at least 8 of the latter. There is this to be said, however, in this connection : that the proportion of mortality from these causes is steadily diminishing ; and my observation shows that this diminution is largely the result of an amelioration of the conditions, especially of country practice, due to better roads and methods of locomotion, increased comfort in living, and less physical strain upon the practitioner. Ten years ago the resort to stimulants upon exposure to the weather, and under the harsher conditions of practice which then obtained, was much more common than it is to-day. And this is also true of the use of opiates and hypnotics. The practitioner, familiar with their power to temporarily stimulate to further endurance, or to produce sleep when nervous and exhausted, had formerly greater temptation to resort to the use of these agents, always ready to hand.

While there is a total of 12 deaths reported during the ten years as due to alcoholism direct, there has been only one in the last four years ; and of the 18 deaths from over-doses of opiates and hypnotics in the entire period there has been only one in the last three years. In addition to the amelioration in the conditions of practice as a cause of this result, it is only fair to take into consideration also the improved moral status of the profession in this State.

Although the figures and deductions here submitted are believed to be substantially accurate, — being, if any thing, understatements, — they are offered only as a provisional contribution to the study of the subject, which is by no means exhausted. The numbers under observation, and the period covered, are greater than any thing heretofore utilized for this purpose in this country, so far as I am aware, and have cost much labor, which may be materially lightened in the future by very little effort on the part of physicians in making returns of death certificates, and by county clerks in forwarding them to the office of the board. It is hoped that the interest which this presentation of the subject may reasonably be expected to arouse will lead to this result.

CARPET-BEATING IN PARIS. — The Conseil de Salubrité of Paris has prescribed the following conditions under which the beating of carpets will be permitted in the city. The carpets must be brushed and beaten in entirely shut-up rooms, and the dust deposited on the floor will be washed with water containing some disinfectant of potent action. Strips of wool, etc., must be burnt immediately. This action has been taken because of the nuisance caused by the beating of carpets in the open air in the built-up portions of the city, and because of the danger which is believed to exist, due to the fact that many of the carpets come from houses in which contagious diseases have prevailed, and that in the process of beating and shaking the germs are dislodged.

BOOK-REVIEWS.

Discovery of the Origin of the Name of America. By THOMAS DE ST. BRIS. New York, Amer. News Co. 8°. 50 cents.

IT seems almost as if the sober historian owed his thanks to a class of half-learned wanderers on the outskirts of historical studies, for keeping up with the unthinking a certain factitious interest in early American history, and so to produce readers, who in the end learn to distinguish the limits of historical evidence. One of these happy enthusiasts fabricates as a designation for the precipices of the Hudson the words *L'anormée berge*, and of course finds Norumbega along the Palisades. Another finds a rock in a river, — it is so unusual to find rocks in rivers, — and places Leif's-booths in Old Cambridge, Mass. Another finds 'Amerrique,' or something else, attached to a mountain, or presumably attached, and thinks Vespuccius is a humbug. Another finds a Peruvian tribe called by something that sounds like 'America,' and says that the New World was named in that way, it being no matter that the name 'America' was in use for the new continent years before Peru was discovered.

The latest of these whimsical revellers finds, that, after all, Columbus received his reward in having the name of his continental 'find' evolved from 'Amaraca,' — the spot, as he says, where the great navigator first struck the mainland. This last writer has printed a thick pamphlet called 'Discovery of the Origin of the Name of America, — the Most Illustrious Aboriginal National Name of the Continent, by Thomas de St. Bris,' — and undertakes gravely the more difficult task of convincing others, after he has accomplished the far easier one of convincing himself.

The new interest in the study of American history must be accepted, we suppose, with all its train of erratic followers. New interests are always handicapped with such impediments. It is useless to follow Mr. St. Bris in all his gyrations. When he refers to the authority of Wald-see-Müller, and his story of the application of the name of 'America' as history accepts it, there is something delicious in his saying "that ideas of that age were often printed without the slightest reason." We wonder if Mr. St. Bris ever heard that the Spanish Government never recognized during the age of discovery any name for the New World but the 'Indies,' when he tells us that "Charles V., one of the most famous monarchs of the world, gave his western hemisphere one of the most illustrious names of antiquity!" Mr. St. Bris has got yet to learn the alphabet of historical research.

Report of the Dairy Commissioner of the State of New Jersey, 1887. Trenton, State. 8°.

WE have had occasion in the past to congratulate the people of New Jersey on the fact, which we think is generally conceded among sanitarians, that the reports published by the board of health of that State occupy the very first rank in the reports of State boards of health ; and that the work done by that board in improving the sanitary condition of the State, not alone through the instrumentality of beneficent laws, but also largely through the educational influences set at work by the State board, is of the highest order, and cannot but be of immense value to the State, both in improving the health of its people and the value of its property. To Dr. E. M. Hunt, the secretary of the board, more than to any other one man, is this due. Equally worthy of commendation is the work of Dr. William K. Newton, the dairy commissioner of the State. The report of this officer, which is before us, is the second which has been published. It deals with the subject of oleomargarine, the sale of which is prohibited in the State, unless the seller informs the purchaser what the article is, and presents him a printed notice bearing the name of the article, with milk, and with foods and drugs. Penalties for the violation of the law to the amount of \$3,100 have been received during the past year. In the prosecution of those who furnish impure or adulterated milk, \$3,900 have been collected in fines. The report contains a number of interesting special reports, among which are the following : 'Testing for Color in Oleomargarine ;' 'Lard, its Adulteration and Detection ;' 'Condensed Milk ;' 'The Composition and Methods of Analysis of Condensed Milk,' by Prof. H. B. Cornwall ; 'Honey and its Adulteration ;' 'Analysis of Adulterated Honey,' by Shippen Wallace ; 'Vinegar

and its Adulteration;' 'Canned Foods;' 'Candies;' 'Poisoning from Smoked Sturgeon;' 'Baking-Powder;' 'Bread;' 'The Food at the State Camp;' 'Foods for Invalids and Infants,' by Prof. A. R. Leeds;' 'Estimation of Morphine in Opium,' by Prof. H. B. Cornwall; and 'Notes on Drugs sold in New Jersey,' etc., by August Drescher.

American Fishes. By G. BROWN GOODE. New York, Standard Book Co. 8°.

THIS is a book which every devotee of the rod will be glad to possess. Mr. Goode modestly says in the preface that he yielded to his publisher's request for a 'book about fish and fishing in America,' feeling that he knew more on this subject than on any other. Since 1874 Mr. Goode has been more or less closely connected with the United States Fish Commission, has been abroad as the representative of the United States to the foreign fishery exhibitions, and has in several books and innumerable articles published the results of his observations and investigations. For a time Mr. Goode acted as fish commissioner after the death of Professor Baird, resigning the position only that he might devote all his energies to the National Museum.

In the present volume no attempt is made to cover all of the 1,750 species known to exist on this continent: the object has been rather to give information about every North American fish likely to be of interest to the general reader either on account of its food-value or its gameness. All of this information is couched in such language as to be perfectly intelligible to those not conversant with the mysteries of scientific terminology; and, as the author states, the book is intended for "the angler, the lover of nature, and the general reader." A figure is given of nearly every species, and these figures are most admirable, resembling frequently the carefully prepared drawings of the Fish Commission.

Mr. Goode gives vent to one lamentation in which he will meet the sympathy of those who have had the products of their pens published as public documents. It is probable that most of those who have ever had the curiosity sufficient to induce them to take down from the shelves of some country library one from the rows of mourning-clad volumes of government reports have never gone further than the 'honor to transmit.' One of the chief objects of the author in writing this book was to see some of the results of his twenty years' study printed in substantial and dignified shape. We had never thought of our black-clad friends as lacking in dignity, and they are certainly substantial enough for such use as they get; still the public is to be congratulated on having so well made a book on a subject so ably and successfully handled. It is a book on fish and their habits, and there is no attempt to tell of rods and flies.

NOTES AND NEWS.

THE June number of *The Century* opens with the second of Mr. Kennan's illustrated articles, this one being on 'Plains and Prisons of Western Siberia.' The Lincoln history in this number contains chapters on 'The Advance,' 'Bull Run,' 'Frémont,' and 'Military Emancipation.' The last of the present series of illustrated Western articles by Mr. Roosevelt is entitled 'The Ranchman's Rifle on Crag and Prairie.' Another illustrated article is written by Mr. Theodore De Vinne, printer of *The Century*, and is entitled 'A Printer's Paradise: The Plantin-Moretus Museum at Antwerp.' Mr. Burroughs's appreciative article on 'Matthew Arnold's Criticism,' it seems, had been sent to the printer for the June *Century* before Mr. Arnold's death. In the same number Mrs. van Rensselaer points out some of the errors into which Mr. Arnold fell in discussing American art. Professor Atwater's food-article this month discusses the question 'What We Should Eat.' The fiction of the number includes some chapters of Dr. Eggleson's novel, 'The Graysons.' The concluding portion of Henry James's 'The Liar' is given; with two short stories, 'Selina's Singular Marriage,' by Grace Denio Litchfield, and a love-story, 'By Telephone,' by Brander Matthews. A biographical paper is devoted by Mrs. Herrick to Col. Richard Malcolm Johnston, the Southern story-writer. A portrait of Colonel Johnston accompanies the article. In this number there is another article by Mr. Cheney on

bird-songs; there is also a group of poems. — The June *St. Nicholas* has as a leading article, 'A Great Show,' by Prof. Alfred Church, describing the Circus Maximus at Rome. Thomas Nelson Page continues the serial, 'Two Little Confederates,' and Celia Thaxter contributes a children's story, 'Cat's-Cradle.' 'Caterina and her Fate,' by E. Cavazza, is an old Sicilian legend put into verse, and illustrated by R. B. Birch. Among the lighter features are contributions by Amélie Rives, Emilie Poulsson, Margaret Johnson, Estelle Thomson, Julia P. Ballard, Alfred Brennan, and C. W. Miller. — Despite the fire, the June issue of *The American Magazine* is a good number. Among the notable features is a paper on 'Our Defences from an Army Standpoint,' by Gen. O. O. Howard; 'The Art of Entertaining,' by Mrs. Gen. John A. Logan; 'Dickens on the American Stage,' by George Edgar Montgomery; and 'Barbados: The Elbow Island,' by Dr. William F. Hutchinson. — In spite of reports to the contrary, *The Cosmopolitan* magazine will continue to be published. The June number, shortly to be issued, promises to be the best it has ever sent forth. The leading article, upon 'The Romance of Roses,' is an account, by Sophie B. Herrick, of the stories clustering about these universal favorites. It is illustrated by many engravings and by four colored pages.

— Under the head of 'Philosophical Papers, of the University of Michigan,' Andrews & Company, Ann Arbor, are now publishing a second series. These papers were prepared by specialists in the university, under the direction of the philosophical department, and, with but one exception, were read before the Philosophical Society, being selected and edited by Prof. George S. Morris. The series consists of four papers, — 'The Ethics of Democracy,' by Prof. John Dewey; 'Speculative Consequences of Evolution,' by Prof. Alexander Winchell; 'Lessing on the Boundaries of Poetry and Painting,' by Prof. E. L. Walter; 'The Ethics of Bishop Butler and Immanuel Kant' (a thesis for the degree of Ph.D.), by Webster Cook. — Cassell's 'Pocket Guide to Europe,' the 1888 edition of which is just out, was planned by E. C. Stedman, to meet the demand for a general European guide-book, small enough to be carried easily in a gentleman's or lady's pocket, and yet more complete than any other single-volume guide. It was compiled by Edward King of Paris, who personally went over most of the routes described. It was revised by M. F. Sweetser of Boston, and is re-edited and kept up to date by Mr. Stedman, with the aid of experts in the London office of Messrs. Cassell & Company.

— Senator Edmunds has proposed an amendment to the diplomatic and consular appropriation bill, authorizing the government to expend twenty-five thousand dollars for salaries and expenses of a scientific commission of three persons — to be composed of one officer of the army or navy, a geologist and mineralogist, and a naturalist — to visit and report upon the resources of the upper Kongo basin, its products, its minerals, its vegetable wealth, the openings for American trade, and such other information as shall be thought of interest to the United States. Another amendment, which he has proposed to the same bill provides an appropriation of ten thousand dollars for salary and expenses of an agent and consul-general at Borna, in Kongo. The President is authorized to detail an army or navy officer for this service.

— The House committee has reported favorably the international copyright bill, that has already been passed by the Senate, instead of the one introduced by one of its own members. This shows a determination to enact this measure into a law during the present session, and a willingness to facilitate its passage.

— The House committee has given a good deal of attention to the proposed survey for the purpose of ascertaining whether the arid lands of the United States are susceptible of being reclaimed, or not. Popular interest in this matter is aroused all over the West. No more important subject has been brought to the attention of Congress during the present session.

— The delay of Congress in passing the annual appropriation bills prevents the Bureau of Ethnology from making its plans for the field-work of the present season. This bureau is not established by law, but is kept alive from year to year by special appropriations for its work. While there is no doubt that it will be pro-

vided for as usual this year, it is legally impossible to assume that it will in carrying on the work of the bureau.

—Dr. Asa Gray left Harvard College in trust, to aid in the support of the Gray Herbarium of Harvard University, the copyrights of all his books, upon the condition that proper provision be made for the renewal and extension of these copyrights by new editions, continuations, and supplements, such as may be needed in the study of botany, and as may best enhance and prolong the pecuniary value of the bequest.

LETTERS TO THE EDITOR.

. Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Fayette County Meteorite.

IN a notice published in this journal Feb. 3, we gave the name of 'La Grange' to this meteorite, overlooking the fact that this name was already applied to the Oldham County (Kentucky) iron. In order to avoid confusion, we would suggest that this name be dropped, and that instead, this meteorite be designated by the name of the county in which it was found (Fayette County, Tex.); and under this title will shortly appear (*American Journal of Sci-*

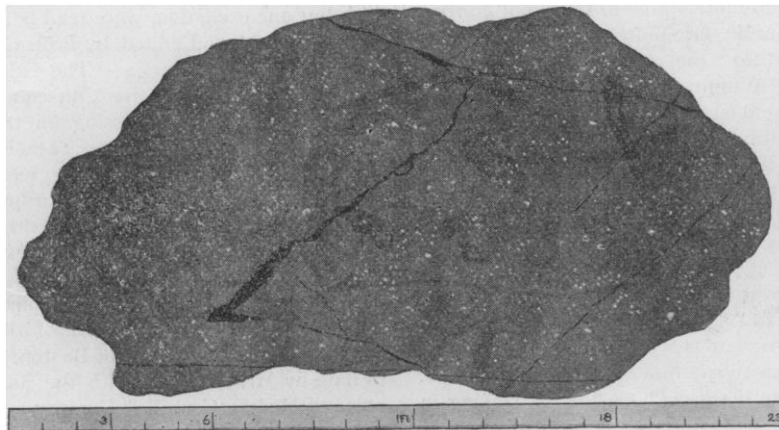
subsequent to the veins, and doubtless at the time of the fall. A dark clouding for the most part surrounds these fissures, the darkest parts being farthest from the fissure, and terminated, in some cases, by a dark line similar to the veins. As all of the fissures are not surrounded by this dark shading, and as some of the clouded spots contain no fissures, it argues that the coloration cannot be the effect of decomposition induced by the cracks, particularly as there is no apparent effect of decomposition extending in from the surface of the stone. The clouding is perhaps older than the cracks, and formed lines of weakness which the cracks followed. Further sections may throw more light on this point.

The general structural appearance of the polished section is that of a fine, compact conglomerate of greenish-gray color. When held so as to reflect the light properly, the grains of iron might, as to number and distribution, be likened to the stars in the Milky Way. Only a few grains attain the size of an eighth of an inch, although two or three grains, composed of iron and troilite, are a full quarter-inch in diameter. Nearly all of the larger grains contain troilite, so that our efforts to develop the Widmanstadian figures were only partially successful.

In making a mould of the stone before cutting it, the surface was thoroughly oiled, which removed a good deal of the iron-rust, showing much more of the original black crust remaining than could be seen at first.

WARD & HOWELL.

Rochester, N.Y., May 24.



ence for June) papers by Mr. J. E. Whitfield of the United States Geological Survey, and Mr. G. P. Merrill of the United States National Museum; the former having worked it up very thoroughly from the chemical side, and the latter microscopically.

They find it to "consist essentially of enstatite and olivine, with a good deal of nickel, iron, and some pyrrhotite." The iron contains over fifteen per cent of nickel, and about two and a half per cent of cobalt.

Since the preparation of these papers, we have cut three slices, an inch and a quarter thick, from the centre of the stone, which enables us to add some interesting facts. The black veins that were observed at several points on the surface are found to extend entirely through the mass, and to be arranged mainly in two sets, in each of which the veins are approximately parallel, the two sets crossing each other at an angle of about 45°. This systematic arrangement of the veins, which may be only accidental, is shown in the accompanying cut, which represents a face of one of the slices.

As the planes of the veins are cut nearly at right angles by the sections, they show on each of them, in approximately the same positions. This is particularly the case with the narrow vein shown at the base of the section. Although only a mere line, it is uniform throughout, and is seen in exactly the same position on all of the sections; therefore we have already revealed the plane of this vein, 15 by 4 inches, with no indications of 'petering out.'

The irregular thick vein also maintains a nearly uniform appearance throughout the four inches of thickness.

The sections also reveal a number of fissures or cracks formed

An Unusual Auroral Bow.

FOR several years past the 'northern lights' at Buffalo have been a rare meteor. Last evening an unusually interesting display was witnessed. As twilight faded, a luminous bank appeared in the north, which increased in brightness and altitude until nearly midnight. This was accompanied by the usual phenomena of a bright aurora; i.e., a yellowish-green color, long streamers emanating from a bright, irregular arch resting on dark clouds, and the eastward billowy motion of the streamers of light. The most interesting part, however, was an arch which rested its extremities on the eastern and western horizons, and passed at first a few degrees south of the zenith, but which drifted several degrees farther south before final disappearance. This arch formed about 9 o'clock, remained sharply defined until 9.45, and at 10.15 was still faintly visible. Its width appeared to be about that of the rainbow, and it was at first as symmetrical. Subsequently it became somewhat bent, and of irregular width. The bends, convex southward, slowly passed along the bow westward. As it faded out, the extremities were displaced by streamers of light. Those in the east were very distinct, and four or more at a time appeared in this columnade.

A phenomenon not before witnessed by me was a steady and rapid drifting or flowing of the luminous, cloud-like matter of the arch from the east towards the west. This could be plainly seen by the unaided eye for about forty degrees of the upper part of the band, and any particular cloud would traverse this space in two minutes.

D. S. KELLICOTT.

Buffalo, N.Y., May 21.